

# **Final Report Juvenile Steelhead and Chinook Salmon Stranding in the Lower Feather River, 2001-2003**

**SP-F10, Task 3C**

# Background Information

- Stranding results from controlled and natural flow fluctuations in rivers
  - Controlled fluctuations typically more severe
- Related to several factors
  - channel morphology, substrate type
  - magnitude, rate, and frequency of flow fluctuations
  - water temperature, time of year, and time of day
  - species and life stage presence and abundance



# OBJECTIVES

- Determine the amount of potential stranding area and resulting fish stranding that occurs during flow reductions
- Evaluate the biological significance of the proportion of the juvenile salmonid population loss due to stranding.
- Assess ability of current flow fluctuation guidelines to minimize stranding events and impacts

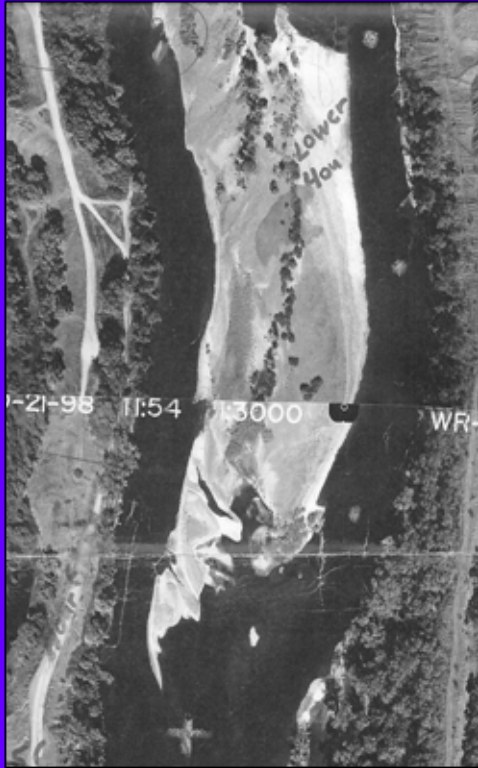


# METHODS

- Identify all ponds between Fish Barrier Dam and Honcut Creek
  - Additional areas below Honcut in subsequent surveys (2003/04)
  - Data included: RM, Flow, and Surface Area
  - Categorized by pond type (Pot hole, Off-channel, and Sidechannel)
- Subset of ponds sampled for stranded salmonids
  - Beach seine or snorkel survey
  - Fish identified, enumerated and measured (FL)
  - Run designated using daily length table for CV.
- Estimated number of stranded salmonids computed by multiplying mean fish density by total ponded area.

# POND TYPES

## Pot hole Ponds



Small, isolated depressions on bar surfaces.

## Off-Channel Ponds



Relatively large pools formed along the lateral margins of bars

## Side channel Ponds



Secondary channels formed along the lateral margins of bars

## ADDITIONAL DATA ANALYSES

- Compare risk of stranding in terms of:
  - Fish size
  - Pond type
  - River mile and month
- Investigate the relationship between cumulative amounts of stranding area per incremental reduction in flow.



## Estimated pond surface area of confirmed isolated basins

Location	Pond Type	River Mile	Pond Area (m <sup>2</sup> )
Thermalito Bar	PH	59.0	520
G95 South Island (1)	PH	57.2	216
G95 South Island (2)	PH	56.9	190
Upper Hour Island	PH	56.3	735
Lower Hour Island	PH	56.1	1,530
Hour Bars	OCP	55.9	4,700
Goose Riffle	OCP	54.8	153
Big Bar	OCP	53.4	1,800*
Upper Macfarland	PH	52.6	784
Lower Macfarland	OCP	52.4	6,746*
Gridley Side Channel (1)	SC	49.5	384
Gridley Side Channel (2)	SC	49.5	1,922
Gridley Riffle	OCP	49.2	13,296*
Shallow Riffle	PH	47.0	312
Herringer Side Channel (1)	SC	46.5	518
Herringer Side Channel (2)	SC	46.5	16,109
Herringer Riffle	OCP	45.2	10,686*
RM 27.5	PH	27.5	4,200
RM 19.0	PH	19.0	1,200

\* Estimated range based on historical aerial photos.

## SUMMARY OF RESULTS 2001-03

Year	Isolated Area	Estimated Number of Stranded Fish		
		CHNF	CHNS	RBTS
2001	23,400	46,998	198	2
2002	-	-	-	-
2003	45,776	84,082	8	1

\* Numbers in red not expanded

Compared to the number emigrated

Year	Estimate Emigrated	% Stranded
2001	29,005,361	0.16
2002	--	--
2003	11,843,353	0.71

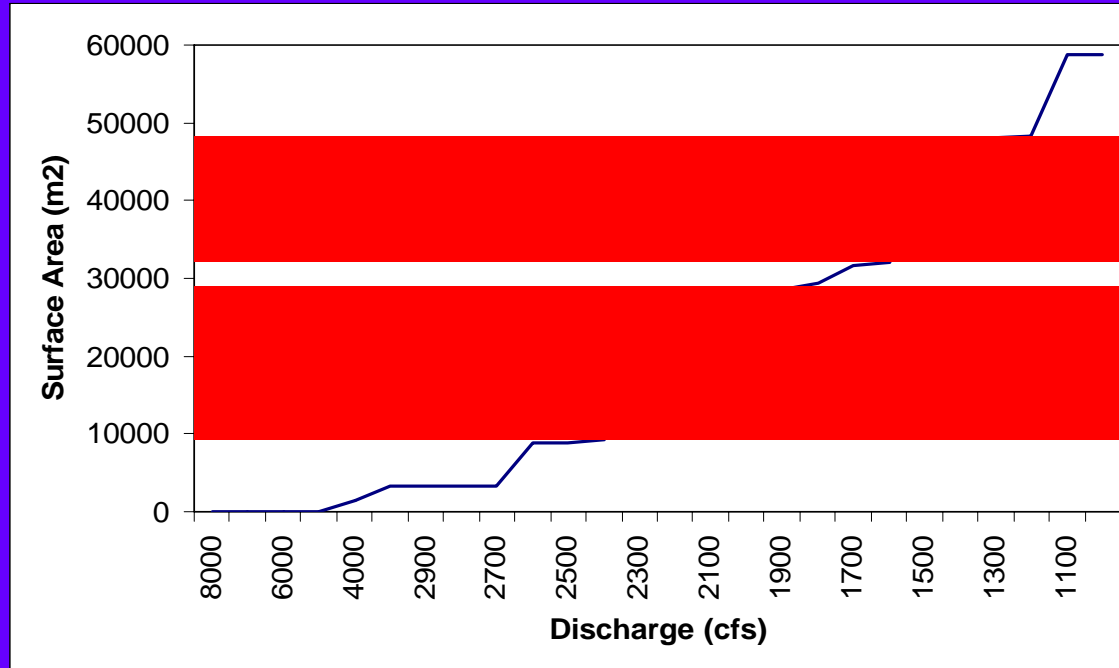


# RESULTS

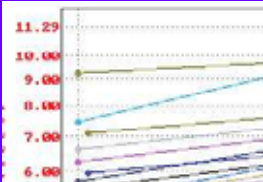
- No statistically significant difference between:
  - Mean size of stranded and non-stranded salmonids
  - Mean size of stranded salmonids between ponds
  - Rank abundance of pond type ( $H=1.17$ ,  $p=0.56$ ).
- No statistical relationship between relative abundance and River mile ( $r^2=0.22$ ,  $p=0.07$ ) and month ( $r^2=0.02$ ,  $p=0.6$ )

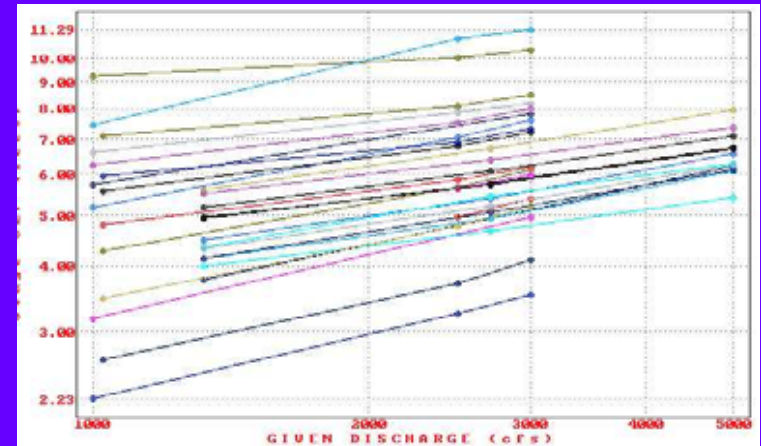


Relationship between cumulative amounts of stranding area per incremental reduction in flow.



# ASSESSMENT OF CURRENT RAMPING CRITERIA

- Recommended rates range from 1 to 6 inches/hr
  - Many recent rates favor a “standard” of 1 inch/hr
    - FERC Project Nos. 186, 637, 2705-003, 10703
  - Ramping rates for Lower Feather River
    - LFC approximately 1/10” per hour
      - 200 cfs steps
    - HFC approximately 2-5” per hour
      - 200 and 500 cfs steps
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# CONCLUSION

- Impact of juvenile salmonid stranding appears very small in comparison to emigrant abundance
- Failed to find statistically significant relationships between stranding and Fish length, RM, Pond type, and Month
  - Lack of repeated measures for a range of flows and time (small sample size)
  - Factors act synergistic
- There appears to be a few critical flow ranges and pond locations
  - 2500 and 1700
  - Large OCPs and SCs (Herringer and Gridley)
- Current Ramping rates compare favorably to other regulated rivers
  - Stranding estimates appear to be low
  - RR doesn't greatly effect stranding for OCPs and SCs